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APPENDIX A: DESCRIPTION OF MAJOR PROGRAMS AND FACILITIES

Appendix A describes programs, organizations, infrastructure, facilities, and future plans of the Lawrence Livermore National Laboratory (LLNL). It provides information on existing activities and facilities, as well as information on those activities anticipated to occur or facilities to be constructed in the reasonably foreseeable future. The purposes of this appendix are to:

- Present information that can be used to evaluate the *Final Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS) No Action Alternative, Proposed Action, and Reduced Operation Alternative
- Identify activities conducted at LLNL that are part of the Proposed Action

Figure A–1 illustrates how this appendix interfaces with other sections and appendices of this LLNL SW/SPEIS.

LLNL is a multiprogram laboratory operated by the University of California (UC) for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The LLNL mission is to ensure that the Nation's nuclear weapons remain safe, secure, and reliable and to prevent the spread and use of nuclear weapons worldwide (LLNL 2003cj). This mission enables LLNL to serve as a national resource of scientific, technical, and engineering capability with a special focus on national security.

LLNL conducts operations at the Livermore Site near Livermore, California, at Site 300 near Tracy, California, and at the Nevada Test Site near Las Vegas, Nevada. Limited activities are conducted at leased properties located near the Livermore Site. LLNL also occupies land leased by DOE for the Arroyo Mocho Pump Station located 6 miles south of the Livermore Site. Figure A–2 and Figure A–3 show the regional locations of the Livermore Site and Site 300 and their locations with respect to the cities of Livermore and Tracy.

This appendix provides an overview of the LLNL operations conducted at the Livermore Site and Site 300, including its research programs, a description of the basic infrastructure of the two sites, and information on the activities within major facilities. Detailed descriptions of operations are limited to selected facilities that: have potentially hazardous operations or inventories, are representative industrial facilities, or have operations unique to the site. Facilities are also discussed that are associated with waste management, security, health services, and emergency response and major new facilities that are currently under construction. Administrative buildings, office buildings, most light laboratory buildings, and nonlaboratory-type facilities without hazardous materials, are excluded from detailed descriptions.

Descriptions of the potential hazards and the typical waste streams and effluents generated are presented in this appendix, for each of the selected facilities.

Section A.1 provides a description of the major programs and organizations at LLNL. Section A.2 provides a description of the site infrastructure, selected facilities, and future plans of the Livermore Site, while Section A.3 describes those of Site 300. Section A.4 presents a number of tabular inventories of generated wastes, chemicals and radionuclides, high explosives, and criteria air pollutants for facilities at the two sites. In addition, Section A.4 includes figures showing waste management facilities at the Livermore Site and Site 300.

A.1 MAJOR PROGRAMS AND ORGANIZATIONS AT LAWRENCE LIVERMORE NATIONAL LABORATORY

A.1.1 United States Department of Energy and National Nuclear Security Administration Programs Supported by Lawrence Livermore National Laboratory

LLNL performs work in support of DOE (including NNSA); other government agencies such as the U.S. Department of Defense (DoD), Nuclear Regulatory Commission, U.S. Environmental Protection Agency (EPA), and U.S. Department of Homeland Security; and private industries through Work for Others projects. The majority of LLNL activities support five major DOE and NNSA programs: Defense Programs, Nuclear Nonproliferation, Environmental Management, Science, and Energy Efficiency.

LLNL also provides support and guidance nationally and internationally for emergency assessments in response to chemical, nuclear, and biological incidents. LLNL organization, which is discussed below, fulfills the missions of the LLNL programs through collaborations, both onsite and offsite, with scientific and institutional support organizations throughout the world. LLNL's organization, presented in Sections A.1.2 and A.1.3, is largely structured to support these programs.

A.1.1.1 *Defense Programs*

Defense Programs achieve national security objectives for nuclear weapons established by the President and assist in reducing the global nuclear danger by planning for and maintaining a safe, secure, and reliable stockpile of nuclear weapons and associated materials, capabilities, and technologies in a safe, environmentally sound, and cost-effective manner. The core functions of Defense Programs are as follows:

- Manage the Stockpile Stewardship Program, which encompasses operations associated with maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile; researching, designing, developing, simulating, modeling, and nonnuclear testing nuclear weapons; and planning, assessing, and certifying nuclear weapons safety and reliability.
- Manage the research, development, and computer simulation facilities that maintain the safety and reliability of the nuclear weapons stockpile in the absence of underground testing

and ensure the capability for maintaining the readiness to test and develop new warheads, if required.

- Manage establishing and maintaining appropriate partnerships with other NNSA and DOE elements; external scientific, research, and development agencies; industry; and academia.
- Ensure, through close coordination with the DoD, that materials, capabilities, and technologies are available to support the production of certified components necessary to extend the lifetime of the nuclear weapons stockpile.

A.1.1.2 *Nuclear Nonproliferation*

Nuclear Nonproliferation enhances U.S. national security through a four-pronged strategy:

- Enhancing the capability to detect weapons of mass destruction, including nuclear, chemicals, and biological systems
- Preventing and reversing the proliferation of weapons of mass destruction (WMD)
- Protecting or eliminating weapons and weapons-useable material or infrastructure, and redirecting excess foreign weapons expertise to civilian enterprises
- Reducing the risk of accidents in nuclear fuel cycle facilities worldwide

A.1.1.3 *Environmental Management*

Environmental Management provides program policy development and guidance for the assessing and cleaning inactive waste sites and facilities and for waste management operations; develops and implements an aggressive applied waste research and development (R&D) program to provide innovative environmental technologies to yield permanent waste disposal solutions at reduced costs; and oversees the environmental restoration of contaminated facilities from various programs, once the facilities are determined to be surplus to their original mission.

A.1.1.4 *Science*

DOE's Office of Science manages programs in high-energy physics, nuclear physics, and fusion energy sciences. It also manages fundamental research programs in basic energy sciences, biological and environmental sciences, and computational science.

A.1.1.5 *Energy Efficiency*

Energy Efficiency programs strengthen America's energy security, environmental quality, and economic vitality in public-private partnerships that enhance energy efficiency and productivity and bring clean, reliable, and affordable energy technologies to the marketplace.

A.1.2 Lawrence Livermore National Laboratory Program Organizations

A.1.2.1 *Director's Office*

The Director's Office leads LLNL in applying its resources in computing, engineering, science, and technology to DOE's programs to maintain the U.S. nuclear weapons stockpile and reduce the international threats posed by weapons of mass destruction. The Director's office comprises the Office of the Deputy Director for Operations, the Office of the Deputy Director for Science and Technology, and the Laboratory Executive Officer.

Deputy Director for Operations

Working with the institutional support organizations, the Deputy Director for Operations has responsibility for ensuring all operational functions of LLNL and for developing policies and programs to support LLNL's mission and workforce, while promoting excellence in business practices, safety assurances, and facility management in compliance with regulatory and contractual requirements.

Deputy Director for Science and Technology

The Deputy Director for Science and Technology is responsible for overseeing the quality of science and technology in scientific and technical program disciplines. This includes management of the LLNL-directed R&D programs; the University Relations Program Office; the DoD Programs Office; and the Office of Planning, Policy, and Special Studies.

A.1.2.2 *Defense and Nuclear Technologies*

Defense and Nuclear Technologies (DNT) ensures the safety, reliability, and security of the U.S. nuclear stockpile without nuclear testing; develops advanced manufacturing and materials technologies to maintain the enduring stockpile; and assures the DOE complex of the safe dismantlement of retired weapons. Multidisciplinary teams apply expertise towards the development of technologies that reduce the U.S. vulnerability to terrorist nuclear threats, enhance the Nation's conventional defense, and support other national needs (LLNL 2002cf). DNT comprises AX-Division, B-Division, the Nuclear Materials Technology Program (NMTP), and the Weaponization Program.

AX-Division

The AX-Division ensures national and global security by maintaining scientific and technical competence and leadership, in the absence of nuclear testing, in all aspects of thermonuclear weapons physics, design, and operation. This involves applying theoretical, computational, and experimental physics to a wide range of problems relevant to national defense and security. Efforts focus on astrophysics, atomic and nuclear physics, computational physics, fluid dynamics and turbulence, high-energy-density physics, radiation transfer, and particle transport.

B-Division

The B-Division integrates experimental and theoretical expertise in high explosive properties and materials science through the use of hydrodynamic testing. Extensive use will be made of the National Ignition Facility (NIF) when it becomes operational.

Nuclear Materials Technology Program

The NMTP provides the overall management and strategic coordination for all LLNL special nuclear material (SNM) and tritium program elements and Superblock facility operations (NMTP 1999).

Weaponization Program

The Weaponization Program provides support for certification and life prediction, the Stockpile Life Extension Program, and information systems. This is accomplished by providing high quality data and assessment and by implementing improved tools and predictive technologies to identify stockpile issues. The objective of the Weaponization Program is to support continued confidence in the safety, performance, and reliability of LLNL's weapon systems in the U.S. nuclear stockpile.

A.1.2.3 *National Ignition Facility Programs*

The NIF Programs support NNSA's Stockpile Stewardship Program mission of ensuring that the Nation's nuclear weapons remain safe, secure, and reliable. The NIF experiments will access high-energy density and fusion regimes with direct applications to stockpile stewardship, energy research, science, and astrophysics (LLNL 2001w). The NIF Programs are comprised of the NIF Project, the Laser Science and Technology (LS&T) Program, and the Inertial Confinement Fusion (ICF) Program.

National Ignition Facility Project

The NIF is a key component of NNSA's Stockpile Stewardship Program. On the NIF, up to 192 laser beams will compress small targets to conditions where they will ignite and burn, allowing the study of physical processes at temperatures approaching 100 million degrees Celsius and 100 billion times atmospheric pressure. These conditions exist in the interior of stars and in nuclear weapons explosions. The experiments will help scientists sustain confidence in the nuclear weapon stockpile without nuclear tests as a unique element of NNSA's Stockpile Stewardship Program and will produce additional benefits in basic science and fusion energy.

Laser Science and Technology Program

The LS&T Program provides advanced solid-state laser and optics technologies to LLNL, government, and industry to support national needs. The primary activities of the LS&T Program in recent years have been to complete laser technology development and laser component testing for the NIF project, develop advanced solid-state laser systems and optical components for DoD and DOE, and address the needs of other government agencies and U.S. industry.

Inertial Confinement Fusion Program

The ICF Program advances research and technology development in areas of fusion target theory and design, target fabrication, target experiments, and laser and optical science and technology. The mission of the ICF Program is to execute high-energy density physics experiments for the Stockpile Stewardship Program in order to demonstrate controlled thermonuclear fusion in the laboratory. Technical capabilities provided by the ICF Program also contribute to other DOE missions, including nuclear weapons effects testing and developing inertial fusion power.

A.1.2.4 *Nonproliferation, Arms Control, and International Security*

Nonproliferation, Arms Control, and International Security (NAI) provides technology, analysis, and expertise to aid the U.S. Government in preventing the spread of WMD and in defending the U.S. against the use of such weapons. The major NAI programs include Proliferation Prevention and Arms Control, Proliferation Detection and Defense Systems, Counter-terrorism and Incident Response, International Assessments, and Center for Global Security Research.

Proliferation Prevention and Arms Control

The Proliferation Prevention and Arms Control Program focuses primarily on integrating treaty-monitoring technology R&D with policy analysis to support U.S. arms control efforts. Major program areas are supporting arms control, monitoring worldwide nuclear explosions, protecting and controlling nuclear materials, disposing of fissile material, and collaborating with former Soviet Union weapons scientists.

Proliferation Detection and Defense Systems

The Proliferation Detection and Defense Systems Program concentrates on proliferation detection and reversal by integrating LLNL capabilities in weapons design to identify signatures of proliferation-related activities and to develop remote and onsite monitoring technologies to detect those signatures. Major program areas are counter-proliferation analysis, proliferation detection systems, tactical systems, and missile and nuclear technology.

Counter-terrorism and Incident Response

The Counter-terrorism and Incident Response Program focuses on the response phase, including responding to incidents involving WMD. LLNL develops technologies and capabilities to deal with WMD emergencies or terrorist incidents. This program also serves as the focus for local, national, and international emergency response to WMD incidents. Major program areas are nuclear threat assessment, nuclear incident response, chemical and biological detection technologies, and forensic science.

The Forensic Science Center focuses on chemical, nuclear, and explosives counter-terrorism. It provides chemical and analytical science and support to the NAI, as well as to other LLNL and national sponsors.

The multidisciplinary staff provides expertise in organic and inorganic analytical chemistry, nuclear science, biochemistry, and genetics, useful for supporting law enforcement and for verifying compliance with international treaties and agreements.

International Assessments

The International Assessments Program addresses the need to avoid surprise regarding the weapons programs of foreign countries. LLNL conducts analyses and research related to the development and deployment of WMD by countries, states, and groups hostile to the U.S. These assessments provide important input to policy makers and diplomats as they develop strategies for U.S. responses to events affecting national and international security. Major program areas are nuclear weapons states, export control, emerging threats, counterintelligence, and proliferation concerns around the world.

Center for Global Security Research

The Center for Global Security Research brings scientists and technologists together with analysts and others from the policy community to study ways in which technology can enhance national and international security. This program supports independent, multidisciplinary research that considers the integration of technology in defense, arms control, nonproliferation, and peacekeeping. Major program areas are reduction in the threats associated with WMD, security implications of emerging technologies, anticipation and management of threats to international security, and future roles of deterrence and military force.

A.1.2.5 *Homeland Security Organization*

LLNL announced the formation of the Homeland Security Organization on December 10, 2002 (LLNL 2002u). The Homeland Security Organization will be the center for LLNL interactions with the Federal Government's Department of Homeland Security. Initially, this organization will be responsible for those LLNL activities explicitly transferred from NNSA to the new Department. Homeland Security at LLNL is divided into six programs: Chemical and Biological Countermeasures, Nuclear and Radiological Countermeasures, Systems Analysis and Studies, Information Analysis and Infrastructure Protection, Border and Transportation Security, and Emergency Preparedness and Response.

Chemical and Biological Countermeasures

This program focuses on addressing the national needs for technologies to quickly detect, identify, and mitigate the use of chemical and biological threat agents against the U.S. civilian population. The principal program is the Chemical and Biological National Security Program, within which are several notable projects, including the Biological Aerosol Sentry and Information System Project, Autonomous Pathogen Detection System, Advanced Biodetection Technology, Biological Signatures, the Forensic Science Center, In situ Chemical Sensors, and Remote Chemical Sensing.

Nuclear and Radiological Countermeasures

The Nuclear and Radiological Countermeasures Program focuses on developing technical capabilities aimed at countering the threat of terrorist use of a nuclear or radiological device in or near a U.S. population center, or from detecting and tracking nuclear material to forensic attribution in the event of a nuclear incident. Projects include nuclear emergency response, cargo container security, radiation detection, and detection and tracking systems.

Systems Analysis and Studies

This program focuses on identifying and understanding gaps in U.S. preparedness and response capabilities and the associated opportunities for technology. Systems studies are conducted to evaluate the effectiveness of alternative approaches to mitigating the damage and disruption resulting from a full range of catastrophic terrorist threats. Elements of this program include homeland security analysis, vulnerability assessment of the U.S. energy infrastructure, and outreach to operation entities.

Information Analysis and Infrastructure Protection

This program is aimed at developing tools and capabilities for gathering, manipulating, and mining vast quantities of data and information for the purpose of detecting early warnings of terrorist intentions. The program consists of the Computer Incident Advisory Center, operated as DOE's cyber alert and warning center; the Information Operations and Assurance Center; International Assessments; and Nuclear Threat Assessment.

Border and Transportation Security

Activities in this area address opportunities for technology to enhance U.S. border and transportation security, from nuclear detection systems for maritime and air cargo and automated facial screening of airline passengers, to integrated data management systems for immigration and border control. Projects supporting this program include concrete-penetrating radar, baggage-screening technologies, and truck-stopping devices.

Emergency Preparedness and Responses

This program focuses on the development of technical capabilities for minimizing the damage and recovering from any terrorist attacks. The program works with local, regional, state, and Federal first responders to ensure that the tools developed meet real-world needs. This program includes: the National Atmospheric Release Advisory Center (NARAC), a leader in real-time assessment of the atmospheric dispersion of radionuclides and chemical and biological agents; Joint Conflict and Tactical Simulation (JCATS); and the Homeland Operational Planning System, developed in partnership with the California National Guard, for homeland security and analysis.

A.1.2.6 *Energy and Environment*

Energy and Environment performs research in water and environment, energy technology, carbon management and climate change, the national nuclear waste repository, and aspects of homeland and national security. Energy and Environment also provides discipline support in atmospheric, earth, environmental, and energy science to other LLNL programs. The six programs in Energy and Environment are described below.

Carbon Management and Climate Change Program

The Carbon Management and Climate Change Program includes research in the areas of climate science, the carbon cycle, carbon management, and the interrelationships between the fate and effects of carbon in the biosphere, atmosphere, ocean systems, and climate change. Research areas include the DOE Program for Climate Model Diagnosis and Intercomparison; DOE's Atmospheric Radiation Measurement Program; programs in atmospheric chemistry; climate research, especially involving the coupling of models to carbon and the increase in model resolution; and carbon management, including research into ocean carbon sequestration, geologic sequestration, and carbon monitoring.

Energy Technology and Security Program

The Energy Technology and Security Program conducts R&D in fossil, renewable, and nuclear energy technologies to increase the efficiency of existing energy technologies while minimizing environmental impact and developing environmentally responsible technologies.

One project is DOE's Highly Enriched Uranium Transparency Implementation Program, which monitors the down-blending of highly enriched uranium (HEU) from Russian nuclear weapons to low enriched uranium that is sold to the U.S. Examples of other projects include developing solid oxide fuel cells, reducing aerodynamic drag of heavy vehicles, researching homogeneous charge compression ignition engines, and researching the cryogenic storage of hydrogen.

National Security Support Program

This program supports LLNL's mission through research, development, and engineering as it relates to homeland security, weapons programs, stockpile stewardship, nonproliferation, international assessment, and defense-oriented program areas. This program identifies, coordinates, and applies science and technology in the areas of earth, atmospheric, and environmental monitoring; risk assessment; data fusion; energy propagation in complex materials; earth system modeling and simulation; and energy technologies.

Risk and Response Management Program

This program includes research and technology development in systems safety, systems security, natural and anthropogenic hazards, and atmospheric release assessment and modeling. The program includes atmospheric release assessment programs for predicting and assessing the dispersal of hazardous material released into the atmosphere, which also encompasses the NARAC; security and protection programs to enhance human vigilance, decision-making, and

control through automation; and risk and safety management, which includes performing risk and hazard assessments, evaluating packaging and transportation safety, and providing regulatory support to government agencies.

Water and Environment Program

This program covers research and development in water security, environmental fate and transport, environmental technologies, and environmental consequence analysis. This program includes work performed by the Center for Accelerator Mass Spectrometry (CAMS); the Marshall Islands Dose Assessment and Radioecology Program, at atolls in the Pacific Ocean contaminated with nuclear fallout from earlier weapons testing; water security projects to protect the Nation's water supplies and distribution systems; projects for protection from global environmental threats; and projects addressing issues of the fate, transport, and consequences of contamination in the environment.

Yucca Mountain Program and Repository Science Program

This program includes materials testing and performance modeling of the storage canister and system of engineered barriers to surround radioactive waste and supports project milestones toward the repository's license application. This program also includes work on international repository initiatives.

A.1.2.7 *Biology and Biotechnology Research Program*

The Biology and Biotechnology Research Program (BBRP) conducts basic and applied research in the health and life sciences in support of national needs to understand causes and mechanisms of ill health, develop biodefense capabilities for national homeland security, improve disease prevention, and lower health-care costs. BBRP work is focused on the following five scientific areas (LLNL 2002an):

- **Biodefense** – Provides the underpinning science and tools needed to combat bioterrorism and infectious disease.
- **Computational and Systems Biology** – Develops a predictive, systems level understanding of biological processes by applying advanced simulation capabilities to complex experimental data.
- **Genome Biology** – Increases understanding of genetic structure, function, regulation and evolution through genome scale approaches to developing, interpreting, and displaying genetic data.
- **Health Effects Genetics** – Increases understanding of the cellular and tissue effects of radiation chemical exposures through novel genomic- and biochemical-based approaches and links this understanding to risk assessments, diagnoses, and treatments.

- **Molecular Biophysics** – Develops and applies tools for measuring biochemical and cellular components and processes, emphasizing data that support predictive understanding through complex simulation and modeling.

A.1.2.8 *Physics and Advanced Technologies*

The Physics and Advanced Technologies (PAT) Program's focus areas include high-energy density physics, astrophysics, condensed matter physics, and nuclear particle and accelerator physics. Program focus areas also include fusion energy, medical technology, imaging and advanced detectors (LLNL 2002bh). The major facilities supporting experimental research include the Ultra-Short Pulse Laser Facility, a two-stage light-gas gun facility, 100-million-electron volt electron-positron linear accelerator, the Electron Beam Ion Trap Facility, and the Experimental Test Accelerator II Facility. To carry out its mission, the PAT is organized into three groups: Physical Data Research, Laboratory-Directed Research and Development (LDRD), and License- and Royalty-Funded Research and Development.

Physical Data Research Program

The Physical Data Research Program provides validated physical data and models for the Stockpile Stewardship Program in the areas of nuclear physics, atomic physics, condensed matter/materials science, plasma physics, and the interaction of radiation with matter.

Laboratory-Directed Research and Development Program

The LDRD Program provides a suitable method for LLNL directors to fund projects that are creative and innovative, but that might not otherwise receive funding via the usual process. LDRD activities are governed by DOE Order (O) 413.2A and other NNSA Headquarters and NNSA Livermore Site Office guidance. Recently, responsibility for the LDRD Program has been transferred to the Laboratory Science and Technology Office.

License- and Royalty-Funded Research and Development Program

The License- and Royalty-Funded Research and Development Program provides private funding for R&D through cooperative research and development agreements (CRADAs) and licensing technologies developed by LLNL. A CRADA is an agreement entered into between the University of California, as operator of LLNL, and one or more participants including at least one non-federal party under which LLNL provides personnel, services facilities, equipment, or other resources towards the conduct of specified Research and Development.

A.1.2.9 *Chemistry and Materials Science*

Chemistry and Materials Science (CMS) provides scientific and technical expertise supporting LLNL's programs, performs work for others under reimbursable contracts, and conducts original research. R&D activities include chemical analysis and characterization, advanced materials, metallurgical science and technology, surfaces and interfaces, energetic materials and chemical synthesis, and energy-related projects. CMS contains three divisions: Chemical Biology and

Nuclear Science Division, Chemistry and Chemical Engineering Division, and Materials Science and Technology Division.

Chemical Biology and Nuclear Science

The Chemical Biology and Nuclear Science Division performs applied research in science at the intersection of biology, chemistry, and nuclear science. Programmatic activities are focused on radiochemistry and nuclear science for the Stockpile Stewardship Program, radiation detection and spectroscopy for proliferation prevention and environmental monitoring, mass spectrometry and ion probe spectrometry, biochemistry and bio-analytical techniques, and state-of-the-art analytical chemistry, including various force and optical microscopy to support LLNL programs. The division also conducts fundamental research in several areas including computational biology, biomolecular and bio-agent interactions and detection and single cell proteomics, heavy element research, transport of actinide colloidal complexes in groundwater, environmental radiochemistry such as cycling of iodine in the environment, isotopically-enhanced molecular targeting, and nanophotonics.

Chemistry and Chemical Engineering

The Chemistry and Chemical Engineering Division conducts fundamental and applied research in chemistry under extreme conditions and on energetic materials and provides chemical engineering in support of national security programs. The division also provides chemistry and chemical engineering support to LLNL programs, including optics development for the NIF, high explosives and energetic materials development for the Stockpile Stewardship Program, and foreign threat assessments and capabilities for development of WMDs.

Materials Science and Technology

The Materials Science and Technology Division conducts fundamental and applied research with a focus on materials properties and performance under extreme conditions. The division also provides metallurgy, ceramics, electrochemical processing, materials science, material characterization, surface science, solid-state chemistry, and materials theory and modeling support to LLNL programs.

A.1.2.10 *Engineering*

Engineering contains two distinct disciplines: Electronics Engineering and Mechanical Engineering. Engineering also operates five technology centers.

Electronics Engineering

Electronics Engineering is responsible for the design and development of the core technologies needed for the development of microtechnologies, laser systems and electro-optics, pulsed-power electronics, diagnostic instrumentation, and advanced computational modeling and simulation. This division also provides instrumentation services, electronics fabrication, design drafting and documentation, computer systems support, and communications systems.

Mechanical Engineering

Mechanical Engineering provides a wide range of design, analysis, fabrication, and testing services to support LLNL programs. This group tests and evaluates engineering materials, designs and develops new experimental hardware and machine tools, fabricates parts, and inspects and assembles mechanical components.

Engineering Technology Centers

Engineering's five technology centers explore future innovations in computational engineering, microtechnology, precision engineering, nondestructive characterization, and complex distributed systems. The centers are responsible for the viability and growth of the core technologies each represents, including designing and building complex instruments and machines ready for production, designing and helping construct most of LLNL's unique test facilities, and conducting research in advanced, broad-application technologies for application across all LLNL programs (LLNL 2003g).

A.1.2.11 *Computation*

Computation provides integrated computing and information environments, scientific visualization facilities, high-performance storage systems, multi-resolution data analysis, scalable numerical algorithms, computer applications, and information management systems in support of LLNL missions and programs. Directorate missions include providing a balanced, seamless, high-performance computing environment that scales from desktop to petaflop; design, development, and delivery of integrated information systems and multidisciplinary applications; and development and implementation of software technologies to optimize software development and maintenance (LLNL 2003h). Computation is a key partner in the execution of the Advanced Simulation and Computing Initiative (ASCI). To carry out its mission, Computation is organized into three groups.

Integrated Computing and Communications

The Integrated Computing and Communications (ICC) group provides computing and networking environments to support stockpile stewardship computational efforts and a variety of other programs at LLNL. This group also undertakes essential computational, communication, and computer security research required to sustain this computing environment. Divisions in this group include High Performance Systems, Science and Development, Computer Systems Support, and Networks and Services.

Computing Applications and Research Department

The Computing Applications and Research (CAR) Department partners with other LLNL programs to develop software technologies and application codes in support of NNSA's mission in the defense, energy, and life sciences. This organization also conducts collaborative R&D in computer science, mathematics, and scientific computing focused on the long-term needs of LLNL and NNSA programs.

Chief Information Officer

The Chief Information Officer for the Computation Directorate provides oversight for information technology (IT) at LLNL. Of chief concerns are maximizing common IT solutions for economy of scale and uniformity of purpose; providing IT solutions; and interacting with DOE, NNSA, and the U.S. Office of Management and Budget on regulatory issues in security, information architecture, and e-government initiatives.

A.1.3 Lawrence Livermore National Laboratory Institutional Support Organizations

A.1.3.1 *Administration and Human Resources*

Administration and Human Resources is responsible for executing the policies affecting LLNL personnel and administrative support functions. Its mission is to promote initiatives that develop and retain a high-quality workforce and create an environment that enhances LLNL's performance. The Directorate includes Human Resources; Office of Strategic Initiatives and Diversity; Financial/Facility Manager; IT and Projects Office; Staffing and Employment Development; Compensation, Benefits and Worklife Programs; Office of Laboratory Council; Public Affairs; Audit and Oversight; Office of Contract Management; and Industrial Partnerships and Commercialization.

A.1.3.2 *Laboratory Services*

Laboratory Services manages a major segment of LLNL infrastructure and provides services in the areas of administrative information systems, plant engineering, procurement and material, innovative business and information services, utilities, and telecommunications systems.

A.1.3.3 *Safeguards and Security Organization*

The Safeguards and Security Organization is responsible for protective force operations; information and personnel security, including clearances, badging, and information and security awareness; physical security systems, alarm design, installation, and maintenance; and program planning for policy, risk management, audits and inspections, order compliance, and contract performance.

A.1.3.4 *Safety and Environmental Protection*

Safety and Environmental Protection supports LLNL programs and employees by providing resources and services to meet its objectives of environmental protection, occupational health, employee safety, emergency response, and quality assurance. Safety and Environmental Protection is divided into three departments to manage operational activities: Environmental Protection, Hazards Control, and Health Services.

Environmental Protection

The Environmental Protection Department is responsible for environmental restoration, environmental monitoring, environmental regulatory compliance, and hazardous waste management.

Hazards Control Department

The Hazards Control Department is responsible for minimizing the risks associated with research and support activities at LLNL. This includes biological, chemical, and physical agents and radioactive and industrial hazards associated with both normal operating conditions and emergencies.

Health Services Department

The Health Services Department provides LLNL personnel with onsite medical treatment for urgent drop-in services, personal counseling, health-risk evaluations, medical surveillance, and library services, to help each employee achieve personal health.

A.2 LIVERMORE SITE

The Livermore Site is located about 40 miles east of San Francisco at the southeast end of the Livermore Valley in eastern Alameda County, California. The city of Livermore's central business district is located about 3 miles to the west. The Livermore Site occupies a total area of approximately 1.3 square miles (821 acres). Figure A–2 and Figure A–3 show the regional location of the Livermore Site and its location with respect to the city of Livermore.

Additionally, LLNL conducts limited activities at various offsite properties near the Livermore Site. These include a childcare facility at the Almond Avenue Site in Livermore; a storage warehouse/shop at Graham Court in the city of Livermore used for equipment component storage and for the assembly of laser components; a storage warehouse on Patterson Pass Road in Livermore for receiving and storing the NIF components; and Arroyo Mocho Pump Station, located 6 miles south of the Livermore Site as the primary source of water supply. These nearby offsite properties are shown in Figure A–3. These properties are considered part of the Livermore Site for purposes of discussion in this appendix.

Although LLNL conducts some operations at the Nevada Test Site, these operations are covered in separate *National Environmental Policy Act* documentation for that site and are not addressed in this LLNL SW/SPEIS.

A.2.1 Existing Infrastructure

Infrastructure that supports Livermore Site's operation includes drainage, parking, pathways, telephones, lighting, landscaping, roads, and utilities. LLNL will continue to maintain, expand, and upgrade this infrastructure under the alternatives described in Chapter 3 of this LLNL SW/SPEIS. Figures A.2.1–1 and A.2.1–2 illustrate the site map and major roadways. Utilities serving the Livermore Site include domestic water, low-conductivity cooling water,